

I claim the following:

1. An electrophoresis gel carrier capable of being inserted into an electrophoresis device comprising:
  - (a) a porous polymer layer having opposing top and bottom surface that are separated by opposing sides;
  - (b) a non-porous laminate layer attached directly to said bottom surface of said porous polymer layer, and
  - (c) one or more separation channels oriented generally parallel to an axis of selected said porous polymer layer, wherein each said separation channel has a depth equal to the thickness of said porous polymer layer and is capable of holding a selected separation material.
2. The electrophoresis gel carrier of Claim 1 wherein said porous polymer layer is constructed of polyethylene, reticulated polyurethane or any open cell non-conductive material.
3. The electrophoresis gel carrier of Claim 2 wherein said separation channel contains a separation material selected from the group of polyacrylimide or agarose gel.
4. The electrophoresis gel carrier of Claim 3 wherein said non-porous laminate layer is freely removable from said porous polymer layer.
5. The electrophoresis gel carrier of Claim 4 wherein said laminate layer is a nylon transfer membrane.

6. The electrophoresis gel carrier of Claim 5 wherein said laminate layer is separated from said porous polymer layer by a freely removable non-porous and non-conductive spacer material.
7. The electrophoresis gel carrier of Claim 6 wherein said laminate layer is pre-treated with a reagent that is capable of selectively binding to a specified chemical component.
8. A method for fabricating a porous polymer electrophoresis gel carrier comprising the following steps:
  - (a) preparing a liquid solution of a porous separation material;
  - (b) preparing a layer of porous polymer material having:
    - (i) opposing top and bottom surfaces and opposing sides of equal thickness;
    - (ii) one or more separation channels that are oriented generally parallel to selected axis of said porous polymer layer wherein each said separation channel extends through the entire thickness of said porous polymer layer and is adapted to hold said separation material;
  - (c) attaching a laminate layer directly to said bottom surface of said porous polymer layer;
  - (d) filling each said separation channel with said porous separation material;  
and
  - (e) providing a sample loading well in each said separation channel.

9. The method of Claim 8 wherein said porous polymer material is selected from the group comprising polyethylene, reticulated polyurethane, or any open cell non-conductive material.
10. The method of Claim 9 wherein said laminate layer is an optically transparent material.
11. The method of Claim 10 wherein said porous separation material is selected from the group of agarose or polyacrylamide gel.
12. The method of Claim 11 wherein said separation medium is a combination of agarose and polyacrylamide.
13. The method of Claim 8 where the said opposing sides are sealed by heat or other sealant means.
14. A porous polymer gel carrier for electrophoresis and blotting comprising:
  - (a) a polymer layer comprising a porous polymer material;
  - (b) a porous separation material;
  - (c) one or more separation channels configured to hold said porous separation material wherein each said separation channel is oriented generally parallel to a selected axis of said porous polymer layer and passes entirely between the upper and lower surface of said porous polymer layer; and
  - (d) a laminate layer of non-porous material attached directly to a lower surface of said porous polymer layer.
15. The porous polymer gel carrier of Claim 14 wherein each said separation channels contains a electrophoresis separation material selected from the group of

polyacrylimide or agarose gels.

16. The porous polymer gel carrier of Claim 15 wherein said laminated layer is a nylon transfer membrane.
17. The porous polymer gel carrier of Claim 16 wherein said laminate layer is separated from said porous polymer layer by a freely removable non-porous and non-conductive spacer strip.
18. The porous polymer gel carrier of Claim 17 wherein said laminate layer is pre-treated with a reagent that is capable of selectively binding to a specified chemical component.
19. A method of electrophoresis and blotting using a porous polymer gel carrier comprising the following steps:
  - (a) preparing a porous polymer gel carrier comprising:
    - (i) a polymer layer of porous polymer material having opposing top and bottom surfaces and opposing sides of equal thickness;
    - (ii) a porous separation material;
    - (iii) providing in said polymer layer one or more separation channels configured to hold said porous separation material and oriented in parallel to a selected axis of said top and bottom surface of the polymer layer;
    - (iv) an optically transparent non-porous laminate layer directly to the bottom surface of said polymer layer.
  - (b) filling each said separation channel with said porous separation material;

- (c) providing one or more loading wells for each said separation channel;
- (d) loading a predetermined amount of a sample material into each said sample channels;
- (e) placing said porous polymer gel carrier into an electrophoresis means that is adapted to receive said porous polymer gel carrier;
- (f) applying a predetermined amount of current to said porous polymer gel;
- (g) removing said porous polymer gel carrier from said electrophoresis device; and
- (h) transferring said sample said from separation channel to said laminate layer by blotting.

20. The method of Claim 20 wherein the said porous polymer gel carrier has a freely removable porous non-conducting spacer sheet between said porous polymer layer and said laminate layer.

21. The method of Claim 20 wherein the laminate layer is a nylon transfer membrane.

22. The method of Claim 21 wherein the laminate layer is pretreated with a selected molecular probe capable of selectively binding to a specific chemical component.

23. A porous polymer gel carrier which comprises:

- (a) a porous polymer layer;
- (b) a porous separation material such as agarose or polyacrylimide;
- (c) a non-porous laminate layer attached to the bottom surface of said porous polymer layer.
- (d) one or more separation channels oriented parallel to an axis of the porous

polymer layer wherein said separation channels contain said electrophoresis separation material; and

- (e) a freely removable non-porous, non-conducting spacer sheet placed between said bottom surface of said porous polymer layer and said laminate layer.

24. The porous polymer gel carrier of Claim 23 wherein said sample channels contain an electrophoresis separation material that is a porous separation material, other than polyacrylimide or agarose.

25. A porous polymer gel carrier constructed by a process comprising:

- (a) preparing a polymer layer from a porous polymer material wherein said first layer has opposing top and bottom and opposing sides of equal depth;
- (b) providing in said first layer one or more substantially parallel separations channels wherein each said separation channel is configured to contain a separation material and is oriented parallel to an axis of the first polymer layer wherein each sample channel passes through the entire thickness of the porous polymer layer;
- (c) heat sealing said sides of the first layer;
- (d) attaching a laminate layer directly to the bottom surface of the porous polymer layer;
- (e) filling each said sample channel with said electrophoresis separation material in liquid state; and
- (f) allowing the said electrophoresis separation material to solidify.

26. The porous polymer gel carrier of Claim 26 wherein the laminate layer is a nylon transfer membrane.
27. The porous polymer gel carrier of Claim 27 wherein the nylon transfer membrane is pretreated with a chemical probe that is capable of selectively bonding with a specific chemical constituent of a sample.
28. A porous polymer carrier assembly comprising:
- (a) A porous polymer gel carrier comprising:
    - (i) a porous polymer layer containing one or more generally parallel separation channels containing an electrophoresis separation material;
    - (ii) a second laminate layer bonded directly to the bottom surface of the porous polymer layer.
  - (b) a pair of electrophoresis paddles configured to hold said porous polymer gel carrier comprising:
    - (i) a first electrophoresis paddle configured to hold said porous polymer gel carrier wherein a first end of said first electrophoresis paddle is in contact with a quantity of a buffer solution; and
    - (ii) a second electrophoresis paddle configured to hold said gel carrier wherein a first end of said second electrophoresis paddle is capable of contacting a quantity of a buffer; and
  - (c) a container configured to hold a first and a second quantity of buffer solution, wherein said first quantity of buffer solution is in contact with said first electrophoresis paddle and said second quantity of buffer solution

is in contact with said second electrophoresis paddle.

29. A device for electrophoresis comprising a pair of opposing electrodes, an electrophoresis separation media, a reservoir, and a buffer solution wherein the improvement comprises:

- (a) a porous polymer gel carrier constructed of a porous polymer layer that is bonded directly to a lower laminate layer and which contains one or more separation channels containing an electrophoresis separation material;
- (b) a pair of electrophoresis paddles that are adapted to be placed in a reservoir containing a buffer solution and adapted to transmit current between opposing electrodes of an electrophoresis apparatus in a direction that is perpendicular to the plane of said porous polymer gel carrier wherein said pair of electrophoresis paddles being further adapted to hold said porous polymer gel carrier.